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CHEAP TRANSPORTATION IN THE UNITED STATES.

BY J. A. LATCHA, M. AM. SOC. C. E.

CHEAP transportation for the commerce of the world is one of the most important problems of the age. That nation which reduces to the lowest figure the cost of transferring the immense tonnage of modern commerce from point to point, whether for inland delivery or for foreign shipment, all other things being equal, will dominate the commercial world. The history of the United States for the past thirty years demonstrates the correctness of this statement. Our marvellous growth in population and wealth primarily was dependent upon the creation of our great railroad system. Should that system suddenly be removed from the face of the earth, calamity to the entire world would be so prompt and complete as to appall us in its contemplation. If these facts are conceded, it must be clear that a revival of profitable business in the United States, with accompanying prosperity, can alone be assured by improvements upon that railroad system which will enable us to transport our traffic at constantly diminishing cost. This ought to be self-evident, yet some of our most eminent engineers and able business men assert that the industrial and commercial prosperity of the United States absolutely demands the construction of ship canals in various portions of our country. The writer, many years ago, became convinced that the era of canals for general traffic purposes has long since passed. In arriving at that conclusion it was had in mind that, as usual in matters of importance, exceptions prove the rule. That the Suez Canal is a great and, to-day, a prosperous public thoroughfare none can deny. It must be remembered, however, that from the dawn of history the stream of commerce has trav-

ersed the territory wherein lies the Suez Canal. A pregnant question, however, is what would be the effect upon the use and value of that canal should Russia wrest India and other Asiatic dependencies of Great Britain from that Empire? The commerce of the Orient in that case certainly would not traverse that canal, but would be diverted largely by Russia through Siberia to Europe. Another exception is the Sault Ste. Marie Canal. As all know, that famous artificial waterway is practically less than a dozen miles long and connects about 500 miles of open waterway on Lake Superior with 1,000 miles of lake navigation to the St. Lawrence River. When, however, it is proposed to construct 350 miles of continuous ship canal through New York State, a vastly different proposition is before capitalists and commercial men.

It is not intended, however, at this time to consider in detail the ship canal problem. The needlessness of that, it is believed, will be made apparent by discussing the transportation question from another standpoint. It will be advisable, however, to note that the latest attempts at creating great ship canals for commercial purposes have been notorious failures, financially and commercially. The Manchester Canal and the Baltic Canal in Germany demonstrate this fact. The German government has established a scale of tolls for the use of the Baltic Canal for commercial purposes, varying from fifteen cents to twenty-five cents per ton, the average toll being about twenty cents. As the Baltic Canal is but sixty-one miles long, the average charge on that waterway for tolls alone is $3\frac{27}{100}$ mills per ton per mile. It is desired that this fact shall be kept clearly in mind by the reader. It must be evident, should a ship canal be built connecting New York City with Buffalo, it would cost enormously, and whether that canal be free or be operated on the basis of a toll, the interest charge on cost of that waterway must ultimately be paid by the people. Under the most favorable circumstances a ship canal through New York State cannot cost less than \$500,000,000, involving an interest charge of at least \$12,000,000 to \$15,000,000 annually, exclusive of all charges to be met by the people in opening and maintaining a deep water channel through Lake and River St. Clair, and also the enormous expenditures necessary to deepen and maintain channels and dockage at all the lake harbors.

While the tonnage traversing our great lakes is enormous, and there is no wish to underestimate its importance to our nation, none familiar with the facts will for a moment deny that to-day the commerce carried on our great railroad system vastly surpasses the water traffic in volume and value. None will deny that our waterways started in the race for development greatly in the lead, and if they have fallen behind in the struggle it must be due to the fact that transportation by rail is the method which does, and will increasingly meet modern necessities.

The writer believes transportation by railroad is the essential and only way for the people of the United States to meet the modern commercial competition of the nations of the world; he believes that traffic can be carried from Chicago to New York Harbor by railroad at less cost during twelve months of the year than it can be by the largest, most effective, and cheapest ship canal that ever can be built; he believes the commercial salvation of the people of the United States depends more largely upon the perfection of such a railroad thoroughfare than upon any other public measure; he believes such a thoroughfare can be created by the united efforts of the Trunk Line railroads, or if they will not act, that other measures can assure the construction of such a railroad. An attempt will be made to demonstrate the soundness of these views.

It is well known the competition of India, of Australia, of Argentina, and, especially of Russia, which, within the past three years, has been building railroads at a tremendous pace to deliver its wheat at seaports, is destroying our grain export business, which for a generation secured the gold with which to pay our trade balances. The loss of this business, in addition to the shrinkage of cereal values, has bankrupted many of our greatest railroads within the past six years, with resultant destruction, not only of more than \$500,000,000 of railroad values, but with even greater depreciation of private property dependent for its value on the prosperity of our great transportation system.

If we are to change the present commercial conditions in the United States, we must act immediately. We must perfect facilities enabling us to undersell all other agricultural nations in the markets of Europe. We can do this quickly and relatively for a trifling expense, by the improvement of our old east and

west railroads, thus enabling them to carry at a profit wheat, corn, and meats at such low cost that exports of grain and other agricultural products can be made at New York Harbor, thus controlling the food markets of the world and insuring the return imports of general merchandise from Europe to New York and thence to the far West. If we cannot do this and promptly, we will in a few years have further financial collapse regardless of what may be our currency or our tariff.

The prime requisites for accomplishing improvement in our industrial, commercial, and financial condition are, first, that traffic, and especially grain, must be carried by the shortest and most economical route possible from Chicago and St. Louis to New York City and thence to manufacturing Europe; second, that traffic must traverse the heart of the great manufacturing regions of Ohio and Pennsylvania, insuring the bread stuffs for our laborers in the iron and coal fields at the lowest cost possible, and must be carried upon the best and cheapest thoroughfare for the distribution East and West of the products of the coal and iron regions; third, the railroad of to-day must be built with continuously low grade and light curvature; fourth, coal for motive power must be secured at proper and suitable intervals along the line of such railroad. The importance of the fourth condition is not generally appreciated. This will be made clear later.

The Pennsylvania Railroad, main line, is operated at a total cost of about $3\frac{85}{100}$ mills per ton per mile*; the Philadelphia and Erie Division of the railroad is operated at a cost of about $3\frac{30}{100}$. It is especially desired it be noted that this cost is practically the same as the charge for tolls alone (viz., $3\frac{27}{100}$ mills) on the great German Canal. The main line of the Pennsylvania Railroad has a grade of 83 feet per mile crossing the mountains westward, and a grade of $52\frac{8}{10}$ feet per mile eastbound. That railroad also has ten-degree curvature on its main line. It has fuel on or near its main line from Pittsburg to Altoona, but from Altoona to New York it must haul its fuel long distances for its motive power. The Philadelphia & Erie Railroad has light grades from Sunbury to near Driftwood; thence for 168 miles to Erie it continuously crosses heavy divides involving a succession

* The figures throughout this article represent cost per ton per mile, unless otherwise indicated.

of grades varying from $52\frac{8}{10}$ to 70 feet per mile both east and west. From Emporium to Erie, coal for motive power is secured very near to or along the track. To this latter fact largely is due the economy of operation on that division of the Pennsylvania Railroad.

Upon the completion of the New York, Chicago & St. Louis Railway about fourteen years ago, it was found it was operated at a cost per ton per mile less than any other railroad in the world except the Pennsylvania Railroad. It was quite evident these results were largely due to the straight line and low grades secured on that railroad. That the importance of these physical characteristics may be appreciated, a description of the alignment and gradients will be given. From Buffalo to Dunkirk, a distance of about 42 miles, the gradients are $52\frac{8}{10}$ feet per mile both east and west. From Dunkirk to Fort Wayne, a distance of about 329 miles, the gradients are 21 feet per mile eastbound and 31 feet westbound. These grades are maintained through the cities of Erie, Cleveland, and Fort Wayne. The gradients on the splendid property of the Pittsburg, Fort Wayne & Chicago Railway west of Fort Wayne, a distance of about 150 miles, were 35 feet eastbound and 45 feet westbound when the New York, Chicago & St. Louis Railway was built, hence the same gradients were adopted on the new railway west of Fort Wayne. The maximum curvature adopted on the N. Y. C. & St. L. Ry. was five degrees. The curvature from Buffalo to Chicago is five per cent. and from Dunkirk to Chicago it is only four per cent. There are several tangents over sixty miles long and several thirty miles in length.

The fuel for motive power on the New York, Chicago & St. Louis Railway is hauled from mines to point of consumption an average distance of about 200 miles. With these physical characteristics this road was operated for ten years for an average cost of about 4.15 mills, and to day is operated for about 4.10 mills. It is possible, for the sum of \$400,000 to cut down the gradients on that railway from Chicago to Fort Wayne to 21 feet per mile eastbound and to 31 feet westbound, which would largely reduce cost of operation on that portion of that railway.

It is well known that while the New York, Chicago & St. Louis Railway has complete organization of station facilities and service from Bellevue to Buffalo, yet it is restricted rigorously in

securing local freight and passenger business over two-thirds of its distance that it may not interfere with the local earning capacity of the Lake Shore Railway, which controls the former road. The necessity of giving these details will be apparent later.

Shortly after the completion of the New York, Chicago & St. Louis Railway, the Lake Shore Railway management learned of the advantages accruing from the continuously low grades of the former road, and began the systematic reduction of grades on the older road. Hundreds of thousands of dollars have been expended on the Lake Shore Railway cutting down grades from Chicago to Berea to $17\frac{5}{10}$ feet per mile eastbound, and 35 feet per mile westbound. From Berea to Cleveland the grades east are light, but are $52\frac{8}{10}$ feet per mile westbound. From Cleveland to Collingwood the grades are 35 feet per mile east and light between these points westbound. Within the past year (1896), the grades have been cut down from Collingwood to Buffalo from 35 feet to $17\frac{5}{10}$ feet per mile east, but remain at 35 feet per mile westbound.

Pay tonnage on our Trunk Lines is generally at the rate of three tons east to two tons west. The gradients, therefore, on the Lake Shore Railway are not, as yet, well balanced. The motive power which can haul loaded and empty cars west over 35-foot grades could haul the same number of loaded cars east over a 25-foot grade. To balance the $17\frac{5}{10}$ foot grades east, the westbound maximum should not exceed 25 feet per mile, instead of 35 feet, as on the Lake Shore Railway. These facts are noted because the Lake Shore Railway is the best-operated railroad in the world, perhaps, excepting alone the Pennsylvania Railroad.

It will be very difficult, if not impossible, ever to reduce the gradients for several miles east and west of Cleveland. The resulting excessive cost of operation through Cleveland on that admirably managed railway must always prove a serious detriment to that property.

The fuel for motive power on the Lake Shore Railway is procured from the same sources as by the N. Y. C. & St. L. Railway. With the physical characteristics just described, the Lake Shore Railway was operated for ten years at an average cost of $4\frac{3.0}{10.0}$ mills and is to-day operated for about $4\frac{1.0}{10.0}$ mills.

The importance of the careful analysis of the physical characteristics of the model Lake Shore Railway must be

apparent when methods for improving the operation of our rail-ways are discussed.

The New York Central Railroad has relatively very light grades except through Albany, yet its fuel is necessarily hauled an average distance of about 250 miles, resulting in its cost of operation being about $5\frac{1}{2}\%$ mills. The Erie Railroad has light grades over much of its line, but it is seriously handicapped by the excessively heavy grades on its main line from Marion to Hornellsville, and also is compelled to haul its fuel great distances. These serious disadvantages cause the cost of operation on the Erie Railroad to be excessive, and many of the defects mentioned never can be remedied. The Baltimore & Ohio Railroad labors under even more serious disadvantages than any of the Trunk Lines, with resultant financial disasters to that great property.

The maximum grade from Chicago to Cleveland, to Akron, or to Massillon on any of the Trunk Lines need not exceed 20 feet east and 30 feet west. These grades could be secured for relatively trifling expenditures and would enable those railroads to transport low-priced commodities like grain at a cost much less than at present. To insure the best thoroughfare possible for cheap transportation by railroad from Chicago to New York City, a railroad should be perfected either from Cleveland, Akron, or Massillon to Tamanend via Wampum, Butler, Punxsutawney, Philipsburg, Lock Haven, Williamsport, and Rupert. That route should be perfected by the joint action of the Trunk Line Railroads and should be operated for the joint account of all those great companies. They should be vested by national legislation with just and equitable powers and rights to perfect and operate such a public thoroughfare, embracing among other essential reforms the legalizing of pooling of railroad traffic under the control of the Interstate Commerce Commission or other State agency. Such action is absolutely essential for the commercial and industrial welfare of the United States, owing to the bitter commercial competition of the nations of the world against America.

If such a railroad were perfected as suggested, its physical characteristics would be as follows: From Chicago to Massillon, 360 miles, the maximum grades would be 20 feet east and 30 feet west; from Massillon the grades would be 30 feet east and 40

feet west for 118 miles to Butler; from Butler to Milesburg, a distance of about 122 miles, the maximum grade east would be 45 feet and $52\frac{1}{10}$ feet west, thus crossing the mountains with grades much less both east and west than those on the main line of the Pennsylvania Railroad; the maximum grade east would be 35 feet and 45 feet west from Milesburg to Tamanend, a distance of about 120 miles. From Tamanend to New York the grades east would not exceed 35 feet and 45 feet west *via* either the Lehigh Valley Railroad or by the Central Railroad of New Jersey. Good connections also could be made to New York *via* the Lackawanna, the Reading and the Pennsylvania railroads.

Bituminous coal for fuel could be secured on the proposed railroad at Massillon, at Butler, at Punxsutawney, at Philipsburg, and near Snow Shoe, as well as at several intermediate points. That railroad would pass through the heart of the anthracite coal regions of Eastern Pennsylvania, insuring fuel for motive power on much more advantageous terms than does any existing Trunk Line railroad. A railroad could be perfected through the territory described, and of the characteristics named, which would not exceed 850 miles in length between Chicago and New York city, and which could be operated at a cost less per ton per mile than can any existing railroad in the world. A few details will demonstrate the correctness of this statement.

As has been stated, the New York, Chicago & St. Louis Railway is operated at a cost of $4\frac{1}{10}\%$ mills. Should a railroad be perfected from Chicago to Massillon with 20 feet grades east and 30 feet grades west, instead of 35 feet east and 45 feet west, as now exist on the New York, Chicago & St. Louis Railway west of Fort Wayne for 152 miles, and should that railroad be free to make every effort to secure all freight, both local and through, it possibly could, it certainly could be operated at a cost not exceeding $3\frac{1}{10}\%$ mills between Chicago and a point 100 miles west of Massillon, to which point coal for motive power could be hauled economically from the latter city. If the Philadelphia & Erie Railroad can be operated over grades existing on that line for $3\frac{1}{10}\%$ mills, the proposed railroad, with coal on its line at convenient points from Massillon to the Lehigh River, and with grades only 20 feet east from a point 100 miles west of Massillon and with grades only 30 feet east of Massillon to Butler

and with maximum grade of only 45 feet east across the mountains to Milesburg, and with maximum grade of only 35 feet east from Milesburg to New York city, must be operated for $2\frac{5}{10}\%$ mills, and the total average cost of operation would not exceed $2\frac{7}{10}\%$ mills.

For the purpose of demonstrating the soundness of these conclusions, it will be assumed that an entirely new railroad is built from Chicago to New York, a distance of 850 miles. All freight cars on a railroad as proposed should have a maximum capacity of 60,000 pounds. They should be equipped with safety couplers, air-brakes, etc. But while the cars should have a capacity of 60,000 pounds, the average pay load will be estimated at the extremely low figure of 15 tons per car. To insure the most systematic and economical results, the proposed railroad should be operated in three divisions of 120 miles each from Chicago to Massillon, a total distance of 360 miles. Over these divisions sixty loaded cars could be hauled with one engine and crew, the grades being 20 feet eastbound and 30 feet west. From Massillon to Butler, a distance of 118 miles, forty-five loaded cars could be hauled east by the standard engine over 30-foot grades. From Butler to Milesburg, 122 miles, two standard engines could haul sixty loaded cars with one train crew, the maximum grades being 45 feet east and $52\frac{8}{10}$ feet west. From Milesburg to New York, a distance of 250 miles, the line should be operated in two divisions, and a standard engine and one crew could haul forty loaded cars east over 35-foot grades. The average trainload, therefore, eastbound would be fifty-two loaded cars of fifteen tons pay load each, or a total load of 780 tons.

With the low grades arranged in divisions as described and with fuel over two-thirds the distance, the motive power department, with full trains moving continuously from Chicago to New York, unquestionably could be operated for not to exceed 12 cents per train mile. But the cost for motive power will be taken at the average cost of 14 cents per train mile. The motive power expenses on each through train, on the 850 miles, for engineers, firemen, oil, waste, repairs, etc., at 14 cents per train mile, and including the extra engine on the summit division, would be the sum of \$136. The railroad as described would be operated in seven divisions. Through express freight trains moving continuously night and day would average at least 20 miles per hour.

Each train would cost on each division for trainmen and for train supplies not to exceed \$15, or a total for the seven divisions, the sum of \$105 for the through run. With an average of 52 cars on each train the cost for repairs, renewals, and interest on cars, etc., would not exceed \$75 for each through train. The cost for maintenance of way and structures for each train of 52 cars would not exceed \$105. The cost for expenses of terminal and intermediate yards, etc., for each through train would not exceed \$100. The general expenses of all kinds, including train dispatching, would not exceed \$75 per train. The total average cost, therefore, for each through train of 52 cars loaded with grain from Chicago to New York would be as follows :

Motive Power Department.....		\$136
Conducting transportation {	Trainmen and train expenses.....	\$105
	Maintenance of cars and interest	75
	Yard and terminal expenses.....	100
		<hr/>
Maintenance of way and structures.....		\$280
General expense, including dispatching		105
		75
		<hr/>
Total expenses for one through train of 52 cars....		\$596

This estimate is based, not on any local business, but exclusively on through tonnage. The expenses for local business would be covered by higher rates as explained later.

The average charge for carrying wheat on existing railroads from Chicago to New York City, for several years, has been about twelve cents per bushel. If a single-track railroad with ample passing tracks were completed through the territory named and upon the basis outlined, it could carry agricultural products from Chicago to New York Harbor at a cost not exceeding one and one-quarter mills, and at that charge, which would be practically three cents per bushel, we could undersell all other agricultural nations on earth. That a railroad as described could carry traffic on the basis named will be made clear by a few details deduced from the facts just stated. If a train, averaging 52 cars, each carrying fifteen tons of wheat, were hauled from Chicago to New York, and if the charge on that grain were one and one-quarter mills, the charge per car for the 850 miles would be \$15.94 and for the average train load of 52 cars the total charge would be \$828.88. The total cost of transportation for one through train of 52 cars would be \$596, and the net earnings on each through train loaded with grain would be \$232.88, or 28 per cent.

The merchandise tonnage, westbound, would average about two to three tons of food products eastbound. The train west, therefore, would average about thirty-four cars loaded with eighteen empty. If the rate west on low-priced tonnage were fixed at the charge of two and a half mills, that traffic would pay satisfactorily. The earnings on each loaded car at two and a half mills would be about \$30. On the thirty-four loaded cars the gross earnings would be \$1,020. The cost for transporting the fifty-two cars west, including the eighteen empty cars, would be somewhat less than the cost eastbound. The difference, however, will not be noted in the estimate, but the same cost for transportation, viz., \$596, will be adopted for the west haul. The gross earnings on thirty-four loaded cars west, as stated, would be \$1,020; operating expenses, \$596; net, \$424, or about 43 per cent. High-class goods, such as silks, wines, etc., should bear a charge, on through trains, of from six to eight mills. Local business should bear a charge of from three to four mills, and all classes of tonnage should be carried at an average charge of $2\frac{75}{100}$ mills, as heretofore stated. Such results would be assured on a short, low-grade railroad, with fuel distributed on its line, as herein described. It is in this direction we must seek such economy on our commerce as will enable us to survive as a nation against the competition of the world.

It is worse than useless to talk to-day of ship canals as factors in the struggle before us. The cost for carrying wheat from Chicago to New York *via* the Lakes, transferring from vessels to canal at Buffalo, thence by canal and Hudson River to New York, including interest, insurance, etc., varies from five to six cents per bushel. This cost, however, it is essential to note, does not include expenditures of the United States government, nor of the State of New York, for construction, repairs, and operation of canals and public works necessary for keeping open channels and harbors, and it is this latter fact which renders it needless to hope for any practical decrease in cost of transportation by ship canals. A few details will make this clear.

The most enthusiastic ship canal advocate cannot claim that wheat and corn can be carried from Chicago to New York by canal at an actual cost of less than two and a half cents per bushel, including insurance, etc. If a ship canal be built through New York State with a depth of twenty-five feet of water, all harbors

and channels on the Great Lakes must be provided with the same depth of water. The interest charge on the enormous expenditures necessary to open and maintain such a waterway and harbors would aggregate, in addition to actual cost of transportation, not less than two and a half cents per bushel on grain, and a *pro rata* charge on all other tonnage traversing that route. The actual cost, therefore, on each bushel of grain, including transportation and interest on governmental expenditures, would be five cents and that cost must be met by the nation whether directly by a toll or indirectly by the interest paid by the government, and the waterway would be open only nine months annually.

By joint action, existing Trunk Line railroads can perfect such a railroad thoroughfare as herein described at the trifling cost of \$7,000,000. If they will not do this an entirely new single-track railroad can be perfected from New York to Chicago for \$25,000,000, and that railroad can be completed in eighteen months. A ship canal cannot be built through New York State in less than five years and at a cost of \$500,000,000. In less than five years Russia can and will fatally cripple us commercially, for it must be apparent to those who observe the activity of that great power that our future commercial opponent is that Tartar Empire. We receive no profits whatever from Russia. The growth of that empire is directly in lines antagonistic to the United States. From the profits made from the products of our virgin soil, during the last twenty-five years, we accumulated capital which made resumption of specie payments possible, and enabled us to create our vast manufacturing plants. Russia is following the same policy that made us rich and powerful. British capital is crowding into Russia and Siberia, as it did for three decades past into the United States. The Cossack Giant is struggling for strength and growth, and will strangle us commercially if we do not awaken from our lethargy and face the danger threatening us.

We must make no mistake as to the actual industrial and financial situation in the United States. The decided shrinkage of values in this country began ten years ago, and has been precipitate during the past five years. The hard times and universal discontent caused the voters four years ago to rush to the Democratic party for relief. The result of that election was construed to mean that the people demanded Free Trade, when

actually what was demanded was better times. These did not ensue, and the pendulum swept with more terrific force to the Republican party, and we construed that to mean a demand for Protection. It is of vital importance we read the signs of the times aright.

We had a balance of trade in our favor at the close of 1896 greater than ever before in our history. Yet business prostration notoriously never has been more complete than during the year past, and is now almost as serious as at any previous time. Prices of all grain and farm products, except wheat, never have been less. A mercantile house with a million dollars capital at the opening of the year may do ten millions of business and at the close of the year its invoices may show a capital of \$900,000. That is precisely the situation of the United States. Our vast business with the world during 1896 was conducted at a loss. Had it not been for the misfortunes of all the wheat-producing nations of the earth, other than the United States, we would have financial wrecks from one end of the land to the other. Even as it is, bankruptcies are and have been appalling, and all financial and commercial interests are in most serious straits.

If wheat in Liverpool shall average the price governing during the two years prior to 1896, a permanent reduction of eight or nine cents per bushel on cost of transporting that cereal by railroad from Chicago to New York City would control the grain markets of Europe. At the average prices named, India, with the millions of British money spent on irrigating works for developing the wheat fields of that country and expended in building State railroads for transporting grain, cannot compete for the wheat market of Europe, except at a loss, in three-quarters of its grain-producing territory. Argentina lost money in 1895 on all wheat exported, except from areas having access to ocean navigation. Australia was in worse condition than Argentina. All know the people of the United States for several years have not made any profits on cereals, and should the price of wheat, which is now phenomenally high, owing to the crop failures throughout the world, suddenly crash to the price of a year ago, as it unquestionably will with good crops in all wheat-raising countries, the agrarian movement against railroads in the United States will startle the financial world. The so-called Granger War of a dozen

years ago covered only the trans-Mississippi regions. The storm centre of the coming war will be Michigan, radiating thence to all the Middle Western States, with the Populists and Iconoclasts of the far West the most savage destroyers of accumulated wealth. The shrinkage of values in America to the level of those of Europe is as inevitable and resistless as the movements of the tides. But with wise and timely action we can, in a great measure, meet and render harmless that shrinkage.

If we carry wheat at three cents per bushel from Chicago to New York, we can place 100,000,000 bushels in Europe in excess of what we do to-day. That grain would bring more than \$50,000,000 in gold to us annually. We could command the markets of Europe for meats, representing corn, oats, and forage consumed. These would bring us at least \$50,000,000 additional gold. Other agricultural products, such as cotton, etc., would earn us at least \$50,000,000 annually. If we make such reforms in cost of railroad transportation, as suggested, we can increase our exports of machinery and steel products to South America and other countries beyond belief, enabling us to take a commanding position as a commercial people among the empires of the world.

Instead of a ship canal from New York City to Buffalo, or any other like expedient, it must be manifest that our safety as a nation lies in improving our railroad system and especially must we have a low grade railroad from the far West to the Atlantic seaboard. Such a railroad would serve the great Northwest as no ship canal could. With such a thoroughfare in operation, steamers and barges could carry grain and other tonnage from Duluth to Cleveland, where modern appliances should be erected to transfer the traffic to elevators and warehouses. Railroads now in operation, or a new one, could make connection from Cleveland, with the low-grade railroad to New York City. Then would cheap transportation in connection with the Great Lakes be possible and at a nominal cost for construction.

The lowest cost of carrying grain from Duluth to Buffalo is about 1 $\frac{4}{10}$ % cents per bushel. The average cost at Buffalo, with antiquated facilities for elevating, storing, and trimming grain transferred to canal-boats, is 1 $\frac{1}{10}$ % cents per bushel. Modern appliances at Cleveland would insure the transfer of grain from vessels to cars for less than one cent per bushel, but that cost will be adopted for the purpose of comparison. The grain rate

from Duluth to Cleveland can be made $1\frac{3}{10}\%$ cents per bushel against $1\frac{4}{10}\%$ cents to Buffalo. Grain can be hauled from Cleveland to New York for two cents per bushel on the railroad described, as against three cents from Chicago to New York. The total cost per bushel for transportation, transferring, etc., from Duluth via Cleveland to New York would be $4\frac{3}{10}\%$ cents. No ship canal can carry traffic between these points for that sum. Indeed, it would be much more, including actual cost of transportation and *pro rata* of government expenditures, for opening and maintaining a waterway as herein explained. The route proposed *via* Cleveland would place Duluth and the Great Northwest directly in communication with the iron, coal, and coke business of Ohio and Pennsylvania, which would be of infinitely more value to that territory than would be any advantages accruing from the creation of any ship canal devised by the genius of man.

As the managers of our great railroad system had practical illustration of the tremendous results accruing from the perfection of such a low-grade railroad as herein described, they would make every effort systematically to reduce the grades on their main lines, thus reducing the cost of operation, with far-reaching and advantageous results to the commerce of the nation.

Two illustrations will be given of what could be done in this direction.

The great Southern Railway system reaches almost every portion of the South from Washington and Norfolk. That system has in all over 4,500 miles of railroad. Its main line from Washington to Birmingham is 800 miles long. That corporation represents over \$150,000,000 cash value of railroad property. The main line of that railroad is the aggregation of several railroads built at an early day, without regard to systematic adjustment of gradients or alignment. With the comparatively insignificant sum of \$4,000,000 the 800 miles of main line could be so improved by cutting down grades at various points that heavy trains could be hauled continuously over its entire length, insuring a reduction of at least twenty-five per cent. in operating expenses. There is not another great railroad system in this country where so small an outlay would result in such enormous savings in cost of operation, with accompanying prosperity alike to the entire cotton regions and to the Southern Railway Company.

The Central Pacific Railway is the key to the development of the vast Central West and of the Pacific slope. That railroad crosses the Sierra Nevada Mountains, theoretically with a 116-foot grade against the eastbound tonnage from California, but the grade actually for several miles is 125 feet per mile. East of the Sierras that railroad is physically in condition to be operated at remarkably low cost except for a short distance near the eastern terminus. That railroad represents an investment, National and private, including principal and interest, of over \$100,000,000. With an expenditure of only \$8,000,000 that railroad could cross the great Sierra barrier to commerce with a maximum grade of only 75 feet per mile, and also could greatly reduce the grades immediately west of Ogden. That expenditure of \$8,000,000 would radically reduce the cost of operation for trainmen, for motive power and for permanent way on that railroad. Other vitally important changes in administering that potent agency for serving the people should be instituted, which, in addition to the cutting down of the grades, would reduce the cost of operating the Central Pacific Railway fully thirty-three per cent. This statement is not lightly made. A year or more has been spent by the writer in California and in other far Western States studying this important problem, and it is certain these results can be assured on that railroad. The effects such improvements on the Central Pacific Railway would have on trans-continental commerce must be obvious to all. Not only California, Nevada, Utah, and other Western States would be rehabilitated financially, industrially, and commercially by action in the direction named, but, what does not appear to be understood and appreciated, not a section of the United States from Maine to the Gulf would fail to feel the tingle of reviving circulation through the arteries of trade.

It will require no argument to convince capitalists who had money invested in the great railroad system west of Chicago and St. Louis that had they, five years ago, perfected a railroad thoroughfare from Chicago to New York City, upon which grain could have been carried for three cents a bushel and other agricultural products at a *pro rata* cost, the \$500,000,000 of capital wiped out by reorganizations of bankrupt roads could have been saved from destruction. The Trunk Line Railroads, by united action, could have done that five years ago for an ex-

penditure of \$7,000,000. They can to-day, for that sum, prevent the further shrinkage, within five or six years, not only of railroad but of all values, which will amount to more than \$1,000,000,000 unless immediate action be taken in the direction suggested. Shall we have the foresight to see what is impending, or must we learn by lapse of time that values are shrinking throughout the world and the destruction of accrued wealth sweeping over the earth can only be averted in America by improved appliances for carrying commerce?

From what is herein presented for consideration, the conclusion must be irresistible that the phenomenal growth of the United States in population and wealth has been made possible solely by the creation of our great railroad system, and especially is this true of the empire west of the Mississippi River. Without that railroad system our 70,000,000 of people would not exist. Without that system in healthful and vigorous activity we will cease to be a prosperous, powerful, and contented people.

The nations of the world—Christian and Pagan—are ceaseless in effort to secure supremacy in commerce, wealth, and power. It is time we devote our energies to enlightened effort to develop and strengthen the railroad arteries of our country. Thus can we best defend our common interests against the commercial aggressions of Europe and of Asia.

J. A. LATCHA.